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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/829,010

04/21/2004

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EXAMINER

MAYES, MELVIN C

ART UNIT

PAPER NUMBER

1734

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

01/04/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/829,010

Applicant(s)

LEE ET AL.

Examiner

Melvin Curtis Mayes

Art Unit

1734

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 17-73 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-66, 69, 72 and 73 is/are rejected.
- 7) ☒ Claim(s) 70 and 71 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date. _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

(1)

The finality of the previous Office Action is withdrawn and prosecution is hereby reopened, in view of the following rejections. The amendment filed December 12, 2006 has not been entered.

Claim Objections

(2)

Claims 20, 48, 49, 70 and 71 are objected to because of the following informalities: should read "wt%" as per the specification. Appropriate correction is required.

Claim Rejections - 35 USC § 103

(3)

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

(4)

Claims 17-19, 30-44, 47, 50-66, 69, 72 and 73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knickerbocker et al. 6,607,620 in view of Flaitz et al. 5,130,067.

Knickerbocker et al. disclose a method of processing greensheets to make a ceramic substrate comprising: providing a laminate (monolithic structure) by providing greensheets 20 having active areas 28 screened and patterned by applying conductive paste into vias and onto the surface to form conductive lines and vias after sintering (active area comprising

heterogeneous material pattern of heterogeneous material component), and stacking at least two of the greensheets (dielectric layers and cover layers) with frames 24 such that frames are on the top of the laminate and between greensheets (alternating) to constrain movement including shrinkage of the greensheet within the frame area during stacking and laminating (constraining layer), the frame having openings (windows) of any desired size wherein the edge of an active area of each greensheet is within an opening of the frame; sintering the laminate; and cutting away the frame along cut lines 36 after sintering to produce a plurality of products, the cut lines located between the frame members of the frames and the active areas, the cutting by saw blades or laser cutting. Frames can also be provided to the opposite surfaces of the greensheets. The frames comprise material such as nickel for glass-ceramic greensheets (low-temperature co-fired ceramics) or ceramics such as glass or other greensheet ceramic materials having higher strength than the greensheet on which the frame is applied, and the frames may be laminated or adhered to the individual green sheets by an adhesive layer. For a greensheet thickness of 0.006 inches and frame thickness of 0.005 inches, when a laminate is made of two greensheets is made, the ratio of the total thickness of the greensheets (dielectric body) to the thickness of a frame on the greensheets is 2.4, less than 3.5 (col. 1-5). Knickerbocker et al. do not disclose reducing shrinkage during sintering of the greensheets by applying Z-direction pressure during firing.

Flaitz et al. teach that X-Y shrinkage is controlled and X-Y distortion and Z-direction camber are eliminated during co-sintering ceramic/metal multilayered ceramic substrate by applying Z-direction force during sintering (col. 4, lines 44-68).

It would have been obvious to one of ordinary skill in the art to have further modified the method of Knickerbocker et al. for making a multilayer ceramic substrate by applying Z-

direction force to the glass-ceramic laminate of greensheets and frames during sintering, as taught by Flaitz et al., to control X-Y shrinkage and eliminate X-Y distortion and Z-direction camber. By providing Z-direction force during sintering to control shrinkage, a low-temperature co-fired ceramic having reduced shrinkage is obviously formed.

By providing the frame for glass-ceramic greensheets (low temperature co-fired ceramic) of either nickel, glass or other greensheet ceramic materials having higher strength than the greensheet on which the frame is applied, a constraining layer of a high sintering temperature higher than that of the greensheet (frame of nickel or other greensheet ceramics) or a constraining layer of a low sintering temperature lower than that of the greensheet (frame of glass) is obviously positioned on the greensheets, as nickel or other greensheet ceramic materials such as alumina have sintering temperature higher than that of glass-ceramics while glass has sintering temperature lower than that of glass-ceramics.

(5)

Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knickerbocker et al. 6,607,620 in view of Flaitz et al. 5,130,067 as applied to claim 19, and further in view of JP 49-37921.

Knickerbocker et al. disclose that the frames can comprise glass.

JP 49-37921 teaches that glass is provided with 0.1-6 wt% vanadium oxide for increased strength.

It would have been obvious to one of ordinary skill in the art to have modified the method of the references as combined by providing a glass frames with 0.1-6 wt% vanadium oxide, overlapping the claimed range of 1-10%, as taught by JP '921, to provide glass of

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increased strength. By providing 0.1-6 wt% vanadium oxide in the glass for increased strength, a strong auxiliary component of vanadium oxide that lowers the sintering temperature of the glass is provided.

(6)

Claims 45 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knickerbocker et al. 6,607,620 in view of Flaitz et al. 5,130,067 as applied to claim 17, and further in view of Sakai 6,488,795.

Knickerbocker et al. disclose using an adhesive layer to adhere a frame to each green sheet but do not disclose an adhesive layer of bonding glass.

Sakai teach that metal foils laminated to green sheets suppress shrinkage of the green sheets during firing and teach that glass paste may be coated between the metal foils and green sheets to provide a bond (col. 6, lines 22-25).

It would have been obvious to one of ordinary skill in the art to have modified the method of the references as combined for making a multilayer ceramic substrate by adhering frames of nickel to the glass ceramic greensheets using an adhesive layer of glass paste (bonding glass), as taught by Sakai, as used to provide a bond between metal foil and greensheet. The use of glass paste to provide bonding glass between each nickel frame and greensheet would have been obvious to one of ordinary skill in the art, as suggested by Sakai. The use of a borosilicate glass to adhere the nickel frames would have been obvious to one of ordinary skill in the art as a well known type of glass.

(7)

Claims 47-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knickerbocker et al. 6,607,620 in view of Flaitz et al. 5,130,067 as applied to claim 17, and further in view of JP 2001-158670.

Knickerbocker et al. disclose that the material for the frame should substantially be resistant to movement (warping and shrinkage) during processing of the greensheet and frame and disclose that the frame can be of ceramic including glass or other greensheet ceramic materials.

JP 2001-158670 (JP '670) teaches that to produce glass-ceramic substrates having high dimensional accuracy by restraining sinter shrinkage, restraint greensheet comprising sintering-resistant inorganic material and glass is laminated to the glass-ceramic greensheet laminate. The content of glass in the restraint greensheet is such that the restraint greensheet and glass-ceramic greensheet are joined together during sintering but the restraint greensheet does not shrink during sintering. The content of glass in the restraint greensheet is 0.5-15% by weight (Abstract and computer translation).

It would have been obvious to one of ordinary skill in the art to have modified the method of the references as combined for making a multilayer ceramic substrate by providing the frames as a greensheet comprising 0.5-15 wt% glass, as taught by JP'670, to provide a frame which joins with the greensheets during sintering but does not shrink during sintering. Providing the frames of ceramic would have been obvious to one of ordinary skill in the art to provide frames which withstand sintering of the greensheets, and providing the ceramic frames of 0.5-15 wt% glass, encompassing the claimed ranges of 1-10% and 1-6%, would have been

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obvious to one of ordinary skill in the art to provide frames which join with the greensheets during sintering but do not shrink during sintering, thus providing frames which resist warping and shrinkage during processing including during sintering.

(8)

Claims 67 and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knickerbocker et al. 6,607,620 in view of Flaitz et al. 5,130,067 as applied to claim 19, and further in view of JP 58-115838 Abstract.

Knickerbocker et al. disclose that the frame can comprise glass and disclose that the frames may be adhered to the green sheets by an adhesive layer.

JP 58-115838 Abstract (JP '838) teaches that adhesive material of wax, glass or resin is used to bond ceramic substrates.

It would have been obvious to one of ordinary skill in the art to have modified the method of the references as combined for making a multilayer ceramic substrate by bonding frames of glass to the greensheets using an adhesive layer of glass, as taught by JP '838, as adhesive material that is used to bond ceramic substrates. The use of wax, glass or resin adhesive to bond the frames to the greensheets would have been obvious to one of ordinary skill in the art, as taught by JP '838. The use of borosilicate glass for the glass adhesive would have been obvious to one of ordinary skill in the art as a well known glass composition.

Allowable Subject Matter

(9)

Claims 70 and 71 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

(10)

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

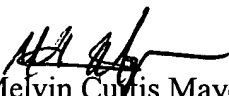
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

(11)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melvin Curtis Mayes whose telephone number is 571-272-1234. The examiner can normally be reached on Mon-Fri 7:30 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris Fiorilla can be reached on 571-272-1187. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


Melvin Curtis Mayes
Primary Examiner
Art Unit 1734

MCM
December 21, 2006